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Date: May 13, 2020

To: Patrick Key, Assistant Director of Environmental Health Division, Director of the Houston Health Department

From: Loren Hopkins, PhD, Chief Environmental Science Officer, Houston Health Department
Laura Campos, MS, Cailey Renken, Lilian Mojica, Chloe Wallace, Braulio Garcia, Jie Min, Rebecca Schneider, Nikki West, Rice University

Re: Analysis of Air Pollution Reductions in Houston (3/1/2020 to 4/15/2020) from Harris County Stay Home Work Safe Order

The objective of this analysis was to determine if concentrations of pollutants of concern in Houston, for which vehicle emissions are partially responsible (nitrogen dioxide (NO_2), particulate matter 2.5 microns and smaller ($\text{PM}_{2.5}$), ozone (O_3), and benzene), have significantly decreased during the Harris County Stay Home Work Safe Order (between March 1, 2020 and April 15, 2020) compared to previous years of the same period (2017 and 2018). Pollution from 2019 was not used for comparison because the ITC fire occurred during this date range in 2019. The comparison to the same time period in previous years was conducted under the assumption that pollution data from these years represent typical conditions (e.g., emissions and weather).

This analysis is intended to provide some insight into how much air pollution in Harris County is caused by vehicle emissions, although Port of Houston activities have also decreased.

The analysis indicates that compared with the same time period in 2017 and 2018:

Nitrogen Dioxide concentrations during the study period in 2020 were significantly lower at 56% of monitors in 2017 and 63% of monitors in 2018. The average daily percent decrease in NO_2 in monitor medians ranged from 12.3 to 44.0 ppb in 2017 and 16.7 to 54.2 ppb in 2018, respectively.

Ozone concentrations during the study period in 2020 were significantly lower at 59% of monitors in 2017 and 72% of monitors in 2018. The average daily percent decrease in O_3 in monitor medians ranged from 16.7 to 25.7 ppb in 2017 and 19.6 to 23.0 ppb in 2018, respectively.

Fine particulate matter concentrations during the study period in 2020 were not statistically lower.

Benzene concentrations during the study period in 2020 were significantly lower at 17% of monitors in 2017 (one of six monitors) and 20% of monitors in 2018 (one of five monitors). The decrease in the daily median at the monitor showing a decrease in 2017 was 33% ppb and the decrease in the median at the monitor showing a decrease in 2018 was 27% ppb.

As an example, the figure below depicts a statistically significant decreasing trend in NO_2 during the time period in 2020 from before HISD Spring Break into the Stay Home Work Safe Order. No decrease was observed in 2017 or 2018 for the same time period.

Figure 2-4 depicts the locations of monitors with a decreasing trend in nitrogen dioxide, ozone and fine particulate matter.

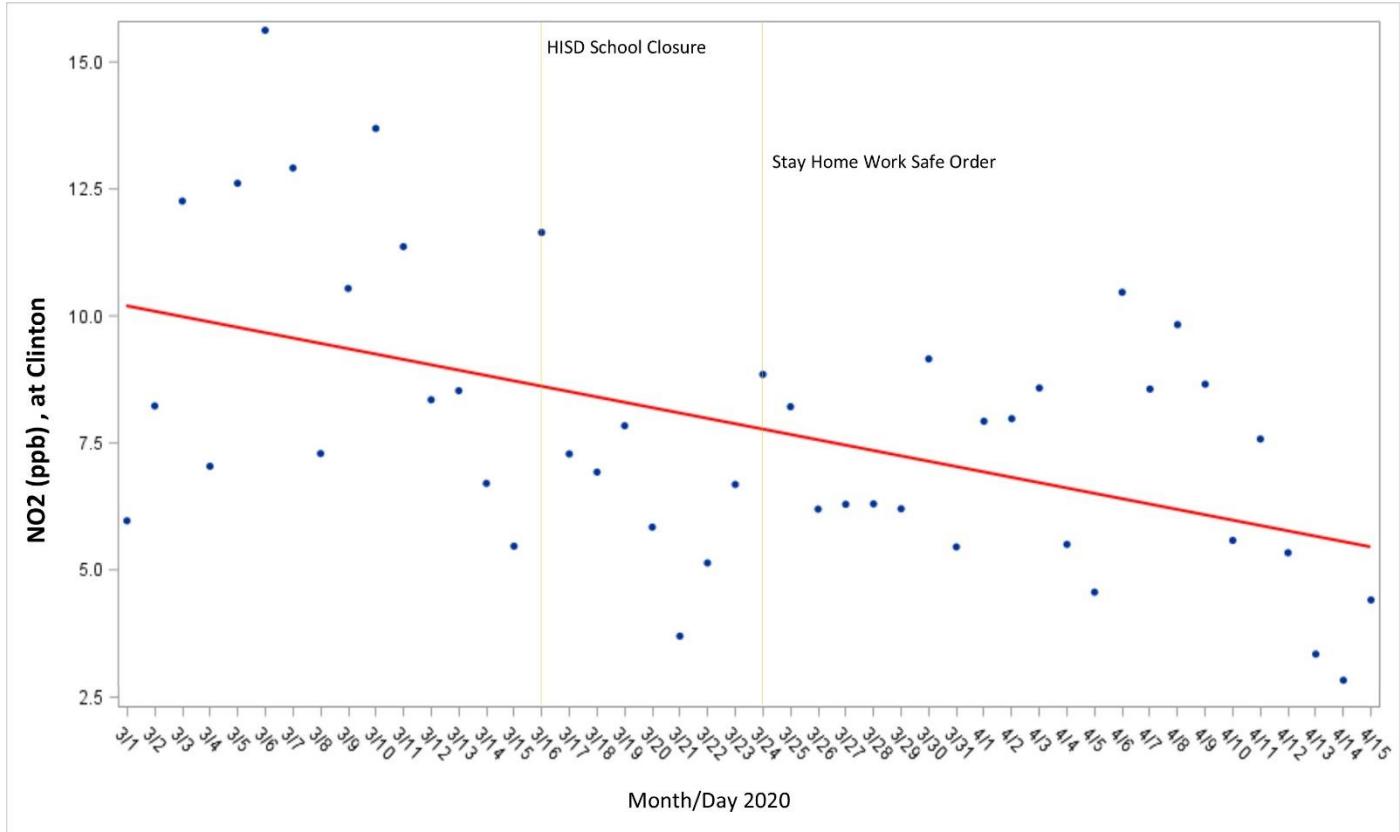


Figure 1. NO₂ significantly decreased at a 5% significance level in Clinton over the course of March, as predicted by school closures and city lockdown orders in 2020 but not in two previous years.

Texas Commission on Environmental Quality: Hourly Data by Pollutant (all sites). https://www.tceq.texas.gov/cgi-bin/compliance/monops/daily_average.pl

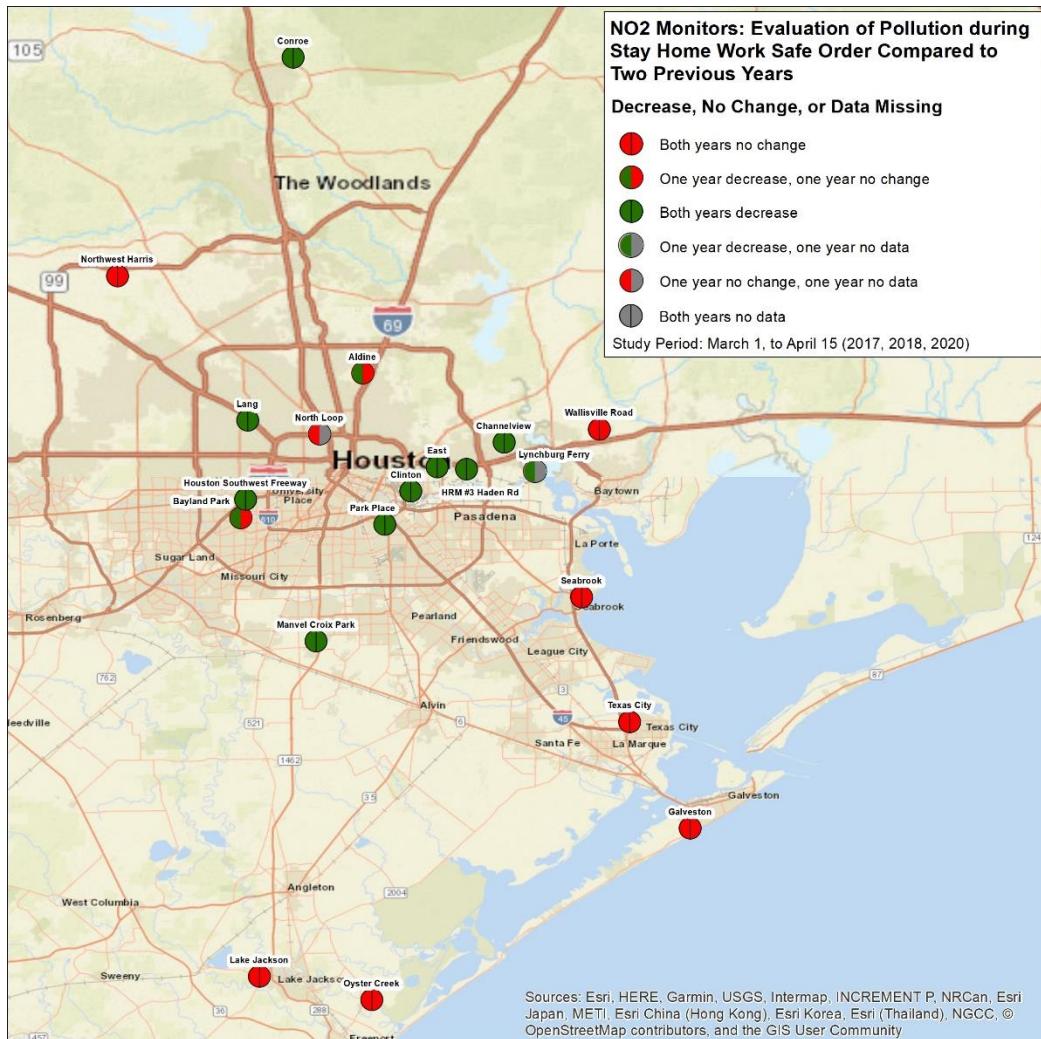


Figure 2. Monitors detecting changes in NO₂ concentrations in 2017 and 2018 vs 2020. NO₂ concentrations significantly decreased in 56% of monitors since 2017 and 63% of monitors since 2018.

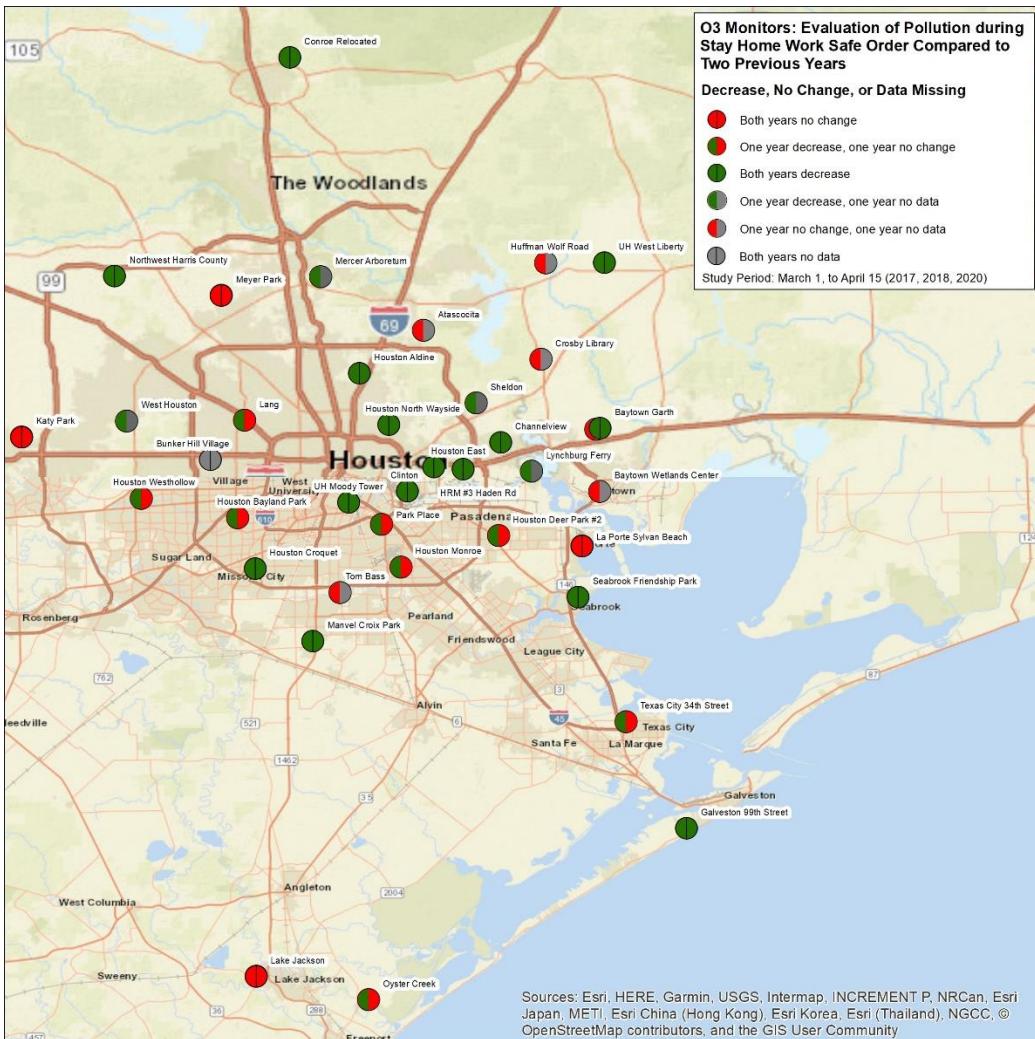


Figure 3. Monitors detecting changes in O₃ concentrations in 2017 and 2018 vs 2020. O₃ concentrations significantly decreased in 59% of monitors since 2017 and 72% of monitors since 2018.



Figure 4. Monitors detecting changes in PM_{2.5} concentrations in 2017 and 2018 vs 2020. There were no significant changes in PM_{2.5} concentrations in 2020.

Methods:

Hourly nitrogen dioxide (NO₂), particulate matter (PM_{2.5}), ozone (O₃) and benzene data collected between March 1 and April 15 for years, 2020, 2019, 2018 and 2017 from all Texas Commission on Environmental Quality (TCEQ) monitors located in Region 12 were obtained.

Monitor years with less than 85% of hourly data recorded during the time period were dropped from the analysis. If a monitor had less than 85% of hourly data recorded during the time period in the year 2020, all years of that monitor were dropped from the analysis.

Year 2019 was dropped from the analysis because the ITC fire occurred during the study period, thus 2019 is not representative of normal conditions.

Data were aggregated to daily concentrations by year, by monitor.

The distributions of daily concentrations by year by monitor were evaluated, using QQ plots and the Shapiro Wilks W-test ($\alpha=0.05$), to determine if the underlying distribution of the data could be considered normal.

The daily concentration data by monitor were evaluated using a multiple comparison procedure to determine if there were statistical differences between years ($\alpha=0.05$). A one-way parametric analysis of variance test was applied to those datasets which could be considered to have a normal underlying distribution. Otherwise the nonparametric Kruskal Wallis test was used.

The daily concentration data by monitor were compared between pairs of years 2017 and 2020 and years 2018 and 2020 using a two sample comparison test, either Wilcoxon Mann Whitney or two sample t-test as appropriate ($\alpha=0.05$), for those datasets where the multiple comparison procedure indicated a statistical difference in the group.

The median percent decrease between 2017 and 2018 compared with 2020 was calculated for each monitor and pollutant with statistically significant decreases, followed by calculation of the 95th confidence interval around the average of the median decrease by pollutant across monitors. Statistics are provided in Table 1-4.

Table 1. PM_{2.5}

Year	PM _{2.5} (ug/m ³)	N	N Miss	Mean	Median	SD	Upper 90% CLM	Lower 90% CLM	Normal Distribution	ANOVA Difference	Two-Sample Test: 2020 lower than Comparison Year	% Decrease Median
2017	UH West Liberty	44	2	7.93	7.40	2.33	8.52	7.34	NO	NO	NA	NA
	Seabrook	45	1	6.90	6.75	2.98	7.65	6.16	NO	NO	NA	NA
	Conroe	46	0	8.02	7.70	2.73	8.70	7.35	NO	NO	NA	NA
	Clinton	46	0	8.57	7.99	3.22	9.37	7.77	NO	YES	NO	NA
2018	UH West Liberty	0	46	.	.	.	.	.	NA	NO	NA	NA
	Seabrook	46	0	7.45	6.65	2.83	8.15	6.75	YES	NO	NA	NA
	Conroe	46	0	8.84	8.86	3.56	9.73	7.96	NO	NO	NA	NA
	Clinton	46	0	10.16	10.48	3.33	10.99	9.34	YES	YES	NO	NA
2020	UH West Liberty	46	0	9.34	8.41	3.60	10.23	8.45	NO			
	Seabrook	46	0	7.64	6.81	2.65	8.29	6.98	NO			
	Conroe	46	0	8.69	8.33	3.29	9.50	7.87	YES			
	Clinton	46	0	9.96	9.30	4.16	10.99	8.93	NO			

SD: standard deviation; CLM: confidence limit of the mean; ANOVA: analysis of variance

Table 2. Benzene

Year	Benzene (ppb)	N	N Miss	Mean	Median	SD	Upper 90% CLM	Lower 90% CLM	Normal Distribution	ANOVA Difference	Two-Sample Test: 2020 lower than Comparison Year	% Decrease Median
2017	Cesar Chavez	46	0	0.18	0.15	0.08	0.20	0.16	NO	NO	NA	
	Deer Park 2	46	0	0.14	0.11	0.11	0.17	0.11	NO	YES	NO	
	Clinton	0	46	.	.	.	.	.	NA	NO	NA	
	Lynchburg Ferry	0	46	.	.	.	.	.	NA	NO	NA	
	HRM-3 Haden Rd	45	1	0.30	0.23	0.19	0.34	0.25	NO	NO	NA	
	Milby Park	46	0	0.16	0.13	0.10	0.19	0.14	NO	NO	NA	
	Galena Park	42	4	1.00	0.58	1.83	1.48	0.53	NO	NO	NA	
	Channelview	45	1	0.35	0.33	0.11	0.38	0.32	YES	YES	YES	33.02
2018	Cesar Chavez	0	46	.	.	.	.	.	NA	NO	NA	
	Deer Park 2	0	46	.	.	.	.	.	NA	YES	NA	
	Clinton	0	46	.	.	.	.	.	NA	NO	NA	
	Lynchburg Ferry	46	0	0.24	0.17	0.25	0.30	0.18	NO	NO	NA	
	HRM-3 Haden Rd	45	1	0.37	0.33	0.26	0.43	0.30	NO	NO	NA	
	Milby Park	46	0	0.19	0.13	0.15	0.23	0.15	NO	NO	NA	
	Galena Park	46	0	0.83	0.43	0.90	1.05	0.61	NO	NO	NA	
	Channelview	46	0	0.36	0.31	0.19	0.41	0.32	NO	YES	YES	26.72
2020	Cesar Chavez	47	0	0.17	0.15	0.11	0.20	0.15	NO			
	Deer Park 2	47	0	0.28	0.23	0.12	0.31	0.25	NO			
	Clinton	47	0	0.29	0.21	0.20	0.34	0.24	NO			
	Lynchburg Ferry	47	0	0.19	0.14	0.17	0.23	0.15	NO			
	HRM-3 Haden Rd	47	0	0.26	0.25	0.12	0.29	0.23	NO			
	Milby Park	47	0	0.16	0.12	0.11	0.18	0.13	NO			
	Galena Park	46	1	0.95	0.62	0.94	1.18	0.72	NO			
	Channelview	47	0	0.27	0.22	0.14	0.31	0.24	NO			

SD: standard deviation; CLM: confidence limit of the mean; ANOVA: analysis of variance

Table 3. NO₂

Year	NO ₂ (ppb)	N	N Miss	Mean	Median	SD	Upper 90% CLM	Lower 90% CLM	Normal Distribution	ANOVA Difference	Two-Sample Test: 2020 lower than Comparison Year	% Decrease Median
2017	Aldine	0	9	.	.	.	.	.	NA	YES	NA	
	Bayland Park	46	0	3.59	2.80	3.12	4.36	2.82	NO	YES	NO	
	Channelview	46	0	8.53	8.51	2.85	9.23	7.82	NO	YES	YES	20.84
	Clinton	46	0	9.53	9.22	2.96	10.26	8.80	YES	YES	YES	19.19
	Conroe	46	0	3.58	3.53	1.67	4.00	3.17	NO	YES	YES	44.00
	East	46	0	10.83	10.33	4.37	11.91	9.75	NO	YES	YES	24.14
	Galveston	46	0	1.97	1.51	1.43	2.33	1.62	NO	YES	NO	
	HRM-3 Haden Rd	46	0	11.44	11.05	3.20	12.24	10.65	NO	YES	YES	12.27
	Houston Southwest Fwy	46	0	11.47	8.88	6.40	13.06	9.89	NO	YES	YES	26.45
	Lake Jackson	46	0	2.29	2.05	1.30	2.61	1.97	NO	NO	NA	
	Lang	46	0	9.58	8.66	4.14	10.61	8.56	YES	YES	YES	30.70
	Lynchburg Ferry	0	32	.	.	.	.	.	NA	YES	NA	
	Manvel Croix Park	46	0	4.63	4.18	2.30	5.20	4.06	NO	YES	YES	21.38
	North Loop	46	0	15.62	16.31	7.33	17.44	13.81	NO	NO	NA	
	Northwest Harris	46	0	3.22	2.92	1.93	3.69	2.74	NO	YES	NO	
	Oyster Creek	46	0	1.15	0.96	0.98	1.39	0.91	YES	YES	NO	
	Park Place	46	0	8.18	7.78	3.42	9.02	7.33	NO	YES	YES	30.33
	Seabrook	46	0	3.24	2.56	2.57	3.88	2.61	NO	YES	NO	
	Texas City	46	0	4.57	4.18	1.48	4.94	4.20	NO	YES	YES	13.38
	Wallisville	46	0	4.67	4.31	2.33	5.24	4.09	YES	NO	NO	
2018	Aldine	46	0	7.49	6.74	3.13	8.26	6.71	NO	YES	YES	32.38
	Bayland Park	46	0	6.64	6.01	3.84	7.59	5.69	NO	YES	YES	29.86
	Channelview	46	0	9.38	8.50	4.54	10.51	8.26	NO	YES	YES	20.74
	Clinton	46	0	10.01	9.79	3.38	10.84	9.17	NO	YES	YES	23.91
	Conroe	46	0	3.14	2.53	2.37	3.73	2.56	NO	YES	YES	21.81
	East	46	0	10.94	10.20	5.13	12.21	9.67	NO	YES	YES	23.15
	Galveston	46	0	1.75	1.51	1.98	2.24	1.26	YES	YES	NO	
	HRM-3 Haden Rd	46	0	12.04	11.64	3.89	13.01	11.08	NO	YES	YES	16.72
	Houston Southwest Fwy	46	0	13.97	14.27	7.94	15.94	12.00	NO	YES	YES	54.21
	Lake Jackson	46	0	2.20	1.90	2.00	2.69	1.70	NO	NO	NA	
	Lang	46	0	10.68	8.65	5.20	11.97	9.40	NO	YES	YES	30.60
	Lynchburg Ferry	46	0	9.17	8.92	3.73	10.09	8.25	YES	YES	YES	22.01
	Manvel Croix Park	46	0	5.33	4.44	3.32	6.15	4.51	NO	YES	YES	25.97
	North Loop	0	2	.	.	.	.	.	NA	NO	NA	
	Northwest Harris	46	0	1.97	1.57	2.18	2.51	1.43	NO	YES	NO	
	Oyster Creek	46	0	1.92	1.87	1.13	2.20	1.64	YES	YES	NO	
	Park Place	45	1	9.98	8.96	5.47	11.35	8.61	NO	YES	YES	39.52
	Seabrook	46	0	3.12	2.75	2.35	3.70	2.54	NO	YES	NO	
	Texas City	43	3	3.59	3.33	1.11	3.88	3.30	NO	YES	NO	
	Wallisville	46	0	4.75	4.39	2.35	5.34	4.17	NO	NO	NA	
2020	Aldine	46	0	4.83	4.55	2.67	5.49	4.17	YES			
	Bayland Park	46	0	4.58	4.21	2.68	5.24	3.91	NO			
	Channelview	46	0	6.77	6.74	3.02	7.52	6.02	NO			
	Clinton	46	0	7.83	7.45	2.81	8.52	7.13	YES			
	Conroe	46	0	2.07	1.98	1.25	2.38	1.76	YES			
	East	46	0	8.40	7.84	3.89	9.36	7.44	NO			
	Galveston	46	0	2.53	2.58	1.40	2.88	2.19	NO			
	HRM-3 Haden Rd	46	0	10.01	9.69	3.55	10.88	9.13	YES			
	Houston Southwest Fwy	46	0	7.13	6.53	5.47	8.48	5.77	NO			
	Lake Jackson	46	0	2.11	2.12	1.35	2.45	1.78	NO			
	Lang	46	0	7.54	6.00	3.61	8.43	6.64	NO			
	Lynchburg Ferry	46	0	7.88	6.95	3.66	8.79	6.98	NO			
	Manvel Croix Park	46	0	3.84	3.28	2.20	4.39	3.30	NO			
	North Loop	46	0	15.45	15.43	7.18	17.23	13.68	YES			
	Northwest Harris	46	0	3.54	2.64	1.88	4.01	3.08	NO			
	Oyster Creek	46	0	1.81	1.72	0.87	2.03	1.60	NO			
	Park Place	46	0	5.80	5.42	3.08	6.56	5.03	NO			
	Seabrook	46	0	3.44	3.11	1.93	3.92	2.96	NO			
	Texas City	46	0	3.87	3.62	1.85	4.32	3.41	YES			
	Wallisville	46	0	5.00	4.49	2.17	5.54	4.47	NO			

SD: standard deviation; CLM: confidence limit of the mean; ANOVA: analysis of variance

Table 4a. Ozone

Year	O ₃ (ppb)	N	N Miss	Mean	Median	SD	Upper 90% CLM	Lower 90% CLM	Normal Distribution	ANOVA Difference	Two-Sample Test: 2020 lower than Comparison Year	% Decrease Median
2017	Aldine	46	0	30.36	31.06	7.14	32.13	28.59	YES	YES	YES	15.39
	Atascocita	0	46	.	.	.	.	.	NA	NO	NA	
	Baytown Garth	46	0	34.49	33.90	7.11	36.25	32.73	YES	YES	YES	15.43
	Bayland Park	46	0	30.56	30.50	6.77	32.24	28.88	YES	NO	NA	
	Baytown Wetlands	0	46	.	.	.	.	.	NA	NO	NA	
	Bunker Hill	0	46	.	.	.	.	.	NA	NA	NA	
	Channelview	46	0	30.22	31.31	7.25	32.02	28.43	YES	YES	YES	22.34
	Clinton	46	0	30.05	30.15	6.88	31.76	28.35	YES	YES	YES	19.63
	Conroe	46	0	34.14	34.31	6.78	35.82	32.46	YES	YES	YES	19.06
	Croquet	46	0	30.42	30.67	6.47	32.02	28.82	YES	YES	YES	16.24
	Crosby Library	14	32	21.61	23.23	8.16	25.47	17.75	YES	NO	NA	
	Deer Park 2	46	0	31.76	30.67	7.39	33.59	29.93	YES	YES	NO	
	East	46	0	29.97	30.38	8.01	31.95	27.99	YES	YES	YES	19.60
	Galveston	46	0	42.41	42.10	8.88	44.61	40.21	YES	YES	YES	26.80
	HRM-3 Haden Road	46	0	30.56	31.20	7.36	32.38	28.74	YES	YES	YES	27.13
	Huffman	0	46	.	.	.	.	.	NA	YES	NA	
	Katy Park	46	0	26.81	26.42	6.05	28.31	25.31	YES	NO	NA	
	Lake Jackson	46	0	33.61	32.50	7.06	35.35	31.86	YES	NO	NA	
	Lang	45	1	28.37	28.46	7.01	30.12	26.61	YES	YES	NO	
	La Porte	38	8	19.21	18.58	3.19	20.08	18.33	YES	YES	NO	
	Lynchburg Ferry	0	46	.	.	.	.	.	NA	YES	NA	
	Manvel Croix Park	46	0	32.90	32.35	6.64	34.55	31.26	YES	YES	YES	20.01
	Mercer Arboretum	46	0	30.13	29.65	2.92	30.85	29.40	YES	YES	YES	24.60
	Meyer Park	46	0	22.18	21.88	4.92	23.40	20.96	YES	YES	NO	
	Monroe	46	0	25.37	24.56	6.42	26.96	23.78	YES	YES	NO	
	Northwest Harris	46	0	30.84	31.23	6.26	32.39	29.29	YES	YES	YES	12.08
	Oyster Creek	46	0	32.12	32.01	7.12	33.89	30.36	YES	YES	NO	
	Park Place	46	0	29.37	29.50	6.76	31.05	27.70	YES	YES	NO	
	Seabrook	46	0	34.88	33.27	8.26	36.93	32.84	YES	YES	YES	24.73
	Sheldon	46	0	27.86	27.79	3.66	28.77	26.96	YES	YES	YES	12.59
	Tom Bass	0	46	.	.	.	.	.	NA	YES	NA	
	Texas City	46	0	40.05	39.40	7.46	41.89	38.20	YES	YES	YES	19.13
	UH Moody Tower	46	0	34.22	34.31	7.41	36.05	32.38	YES	YES	YES	15.61
	UH West Liberty	46	0	29.63	29.07	7.13	31.39	27.86	YES	YES	YES	17.50
	Wallisville	43	3	33.97	33.39	7.05	35.77	32.16	YES	YES	NO	
	Wayside	46	0	27.03	26.85	6.78	28.71	25.35	YES	YES	YES	19.26
	Westhollow	46	0	31.17	31.56	6.58	32.80	29.54	YES	YES	NO	
	West Houston	46	0	30.71	30.15	7.11	32.47	28.94	YES	YES	YES	55.36

SD: standard deviation; CLM: confidence limit of the mean; ANOVA: analysis of variance

Table 4b. Ozone continued

Year	O ₃ (ppb)	N	N Miss	Mean	Median	SD	Upper 90% CLM	Lower 90% CLM	Normal Distribution	ANOVA Difference	Two-Sample Test: 2020 lower than Comparison Year	% Decrease Median
2018	Aldine	46	0	32.02	33.41	6.10	33.53	30.51	YES	YES	YES	21.32
	Atascocita	46	0	26.04	26.71	7.51	27.90	24.18	NO	NO	NA	
	Baytown Garth	46	0	35.73	37.83	6.61	37.37	34.09	NO	YES	YES	24.23
	Bayland Park	45	1	32.53	33.96	6.55	34.17	30.89	NO	NO	YES	13.89
	Baytown Wetlands	46	0	24.63	25.25	7.75	26.55	22.71	NO	NO	NO	
	Bunker Hill	0	46	.	.	.	.	.	NA	NA	NA	
	Channelview	46	0	30.94	32.08	6.49	32.55	29.33	NO	YES	YES	24.20
	Clinton	46	0	29.22	29.96	6.29	30.78	27.66	YES	YES	YES	19.12
	Conroe	46	0	35.08	36.21	5.91	36.54	33.62	NO	YES	YES	23.30
	Croquet	46	0	30.15	31.36	5.74	31.57	28.73	NO	YES	YES	18.10
	Crosby Library	0	46	.	.	.	.	.	NA	NO	NA	
	Deer Park 2	46	0	33.95	35.35	6.59	35.58	32.32	YES	YES	YES	21.57
	East	44	2	29.66	30.19	6.48	31.31	28.02	YES	YES	YES	19.10
	Galveston	46	0	39.39	40.54	8.22	41.43	37.36	YES	YES	YES	23.98
	HRM-3 Haden Road	46	0	29.50	30.87	5.88	30.96	28.05	NO	YES	YES	26.36
	Huffman	35	11	17.80	18.21	4.25	19.01	16.58	YES	YES	NO	
	Katy Park	46	0	24.83	25.58	5.61	26.21	23.44	YES	NO	NA	
	Lake Jackson	46	0	34.48	35.44	6.69	36.13	32.82	YES	NO	NA	
	Lang	46	0	30.44	31.59	6.30	31.99	28.88	YES	YES	YES	17.95
	La Porte	46	0	21.43	22.10	6.27	22.98	19.88	YES	YES	NO	
	Lynchburg Ferry	46	0	31.21	32.02	7.13	32.97	29.45	YES	YES	YES	25.24
	Manvel Croix Park	46	0	34.06	35.85	6.78	35.74	32.38	NO	YES	YES	27.83
	Mercer Arboretum	0	46	.	.	.	.	.	NA	YES	NA	
	Meyer Park	46	0	22.41	22.92	4.33	23.48	21.34	YES	YES	NO	
	Monroe	45	1	29.36	30.17	5.89	30.84	27.89	NO	YES	YES	19.75
	Northwest Harris	46	0	32.43	33.04	5.69	33.84	31.02	YES	YES	YES	16.90
	Oyster Creek	46	0	36.29	36.92	7.78	38.22	34.36	YES	YES	YES	19.07
	Park Place	46	0	30.62	32.35	6.43	32.21	29.03	YES	YES	YES	16.09
	Seabrook	46	0	33.29	33.69	7.07	35.04	31.54	YES	YES	YES	25.66
	Sheldon	0	46	.	.	.	.	.	NA	YES	NA	
	Tom Bass	46	0	20.45	21.02	7.64	22.34	18.56	YES	YES	NO	
	Texas City	46	0	38.68	40.58	8.07	40.68	36.69	YES	YES	NO	
	UH Moody Tower	46	0	34.24	35.65	7.65	36.14	32.35	YES	YES	YES	18.78
	UH West Liberty	46	0	32.84	34.19	6.59	34.47	31.21	NO	YES	YES	29.86
	Wallisville	0	46	.	.	.	.	.	NA	YES	NA	
	Wayside	46	0	25.58	26.50	5.37	26.91	24.25	YES	YES	YES	18.18
	Westhollow	46	0	33.34	34.78	6.33	34.91	31.78	NO	YES	YES	20.49
	West Houston	0	46	.	.	.	.	.	NA	YES	NA	

SD: standard deviation; CLM: confidence limit of the mean; ANOVA: analysis of variance

Table 4c. Ozone continued

Year	O ₃ (ppb)	N	N Miss	Mean	Median	SD	Upper 90% CLM	Lower 90% CLM	Normal Distribution	ANOVA Difference	Two-Sample Test: 2020 lower than Comparison Year	% Decrease Median
2020	Aldine	46	0	26.24	26.28	7.56	28.11	24.36	YES			
	Atascocita	46	0	24.86	25.56	6.93	26.58	23.15	YES			
	Baytown Garth	46	0	28.84	28.67	7.00	30.57	27.11	YES			
	Bayland Park	46	0	28.86	29.24	8.49	30.96	26.75	YES			
	Baytown Wetlands	46	0	27.66	25.81	8.11	29.67	25.65	YES			
	Bunker Hill	46	0	23.55	23.35	7.55	25.42	21.69	YES			
	Channelview	46	0	25.42	24.32	7.59	27.30	23.54	YES			
	Clinton	46	0	24.70	24.23	7.94	26.67	22.74	YES			
	Conroe	46	0	26.94	27.77	7.56	28.82	25.07	YES			
	Croquet	46	0	25.57	25.69	7.32	27.39	23.76	YES			
	Crosby Library	45	1	21.66	21.96	6.75	23.35	19.97	YES			
	Deer Park 2	46	0	29.14	27.73	8.39	31.22	27.06	YES			
	East	42	4	24.46	24.42	7.59	26.43	22.49	YES			
	Galveston	46	0	33.36	30.82	8.86	35.56	31.17	YES			
	HRM-3 Haden Road	46	0	24.26	22.73	7.59	26.14	22.38	YES			
	Huffman	46	0	27.90	28.15	6.89	29.61	26.19	YES			
	Katy Park	46	0	25.47	25.04	7.32	27.28	23.65	YES			
	Lake Jackson	43	3	30.57	28.83	9.48	33.00	28.14	YES			
	Lang	46	0	24.96	25.92	7.41	26.79	23.12	YES			
	La Porte	46	0	28.31	26.63	8.67	30.46	26.16	YES			
	Lynchburg Ferry	46	0	25.14	23.94	7.86	27.09	23.20	YES			
	Manvel Croix Park	46	0	26.64	25.88	7.81	28.58	24.71	YES			
	Mercer Arboretum	46	0	22.44	22.35	7.04	24.19	20.70	YES			
	Meyer Park	46	0	26.05	26.85	7.52	27.91	24.19	YES			
	Monroe	43	3	24.93	24.21	6.96	26.72	23.15	YES			
	Northwest Harris	45	1	26.17	27.46	6.86	27.89	24.45	YES			
	Oyster Creek	46	0	31.93	29.88	7.62	33.81	30.04	YES			
	Park Place	46	0	26.46	27.15	7.28	28.26	24.65	YES			
	Seabrook	46	0	26.64	25.04	8.54	28.76	24.53	YES			
	Sheldon	46	0	24.54	24.29	7.72	26.46	22.63	YES			
	Tom Bass	43	3	26.48	26.63	7.92	28.51	24.45	YES			
	Texas City	46	0	34.72	31.87	9.03	36.96	32.48	YES			
	UH Moody Tower	46	0	28.77	28.96	7.91	30.73	26.81	YES			
	UH West Liberty	46	0	24.01	23.98	7.09	25.76	22.25	YES			
	Wallisville	46	0	30.41	29.35	7.74	32.33	28.50	YES			
	Wayside	45	1	21.12	21.68	6.83	22.83	19.41	YES			
	Westhollow	46	0	28.04	27.66	7.50	29.89	26.18	YES			
	West Houston	43	3	15.33	13.46	7.98	17.38	13.29	YES			

SD: standard deviation; CLM: confidence limit of the mean; ANOVA: analysis of variance